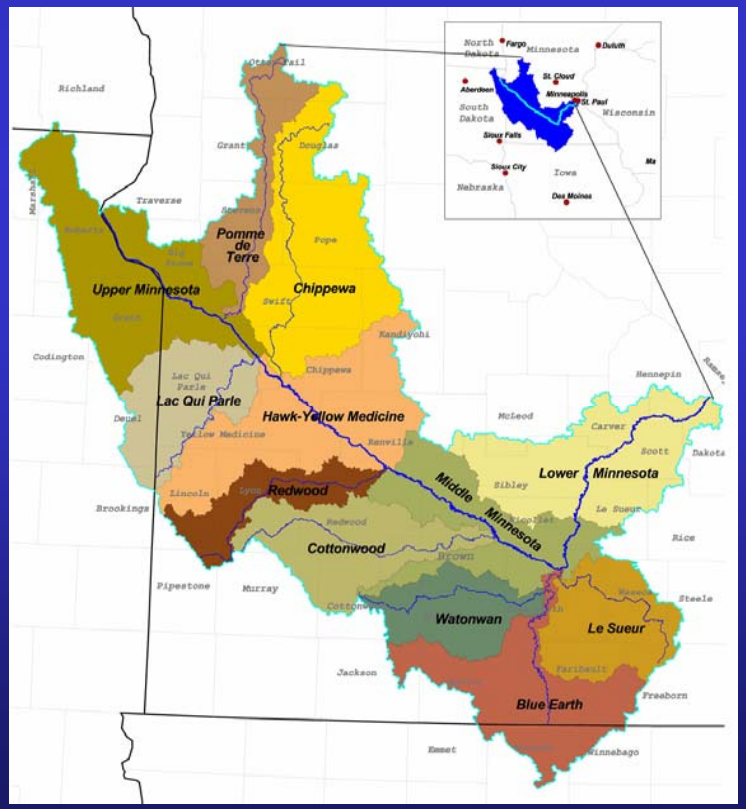
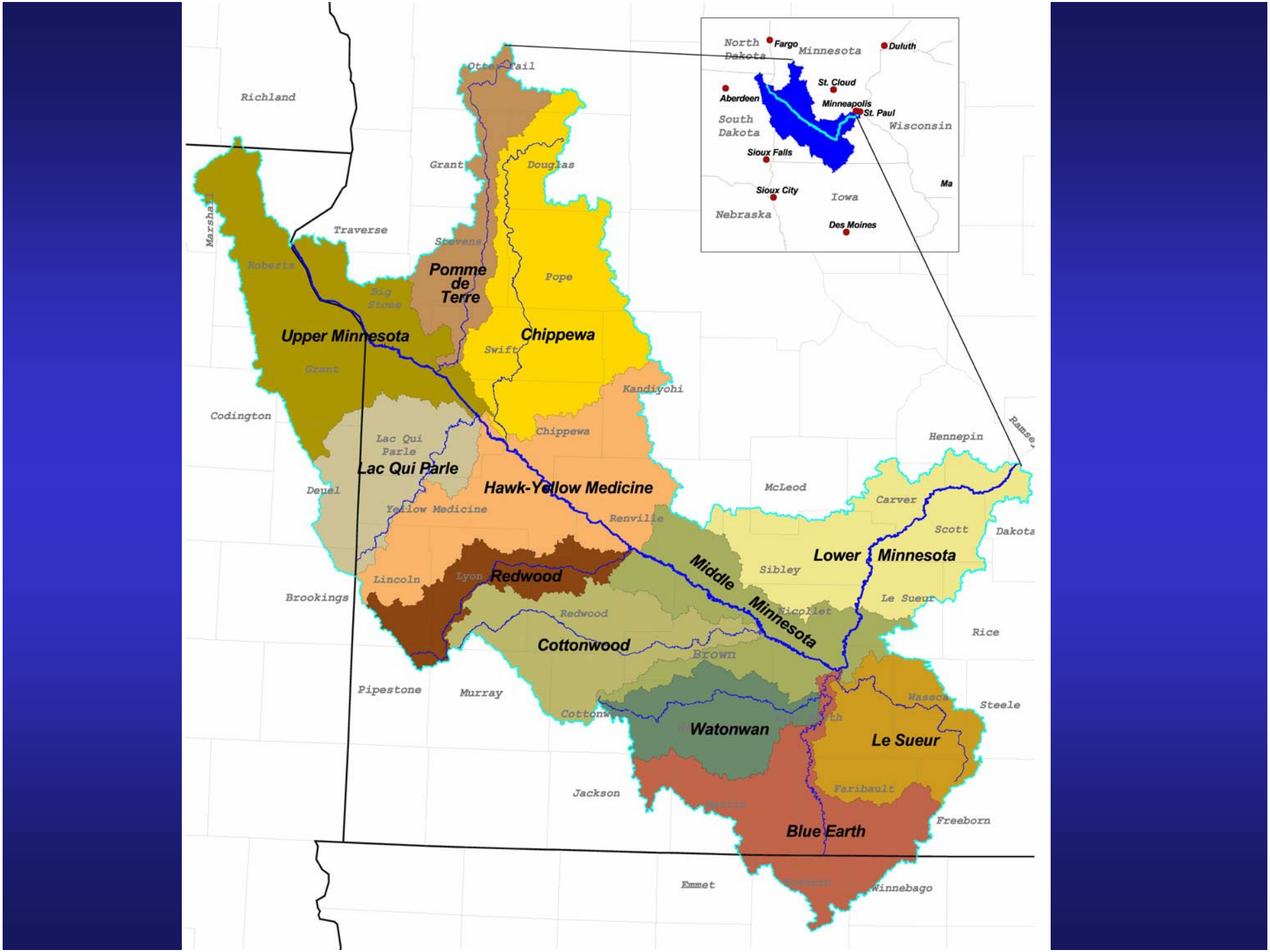
Minnesota River Basin

Integrated Watershed, Water Quality and Ecosystem Restoration Analysis

Decision Support System



US Army Corps of Engineers
St. Paul District


North Dakota
Fargo
Minnesota
Duluth
St. Cloud
Aberdeen
Minneapolis
St. Paul
South Dakota
Wisconsin
Sioux Falls
Sioux City
Iowa
Nebraska
Des Moines
Richland
Grant
Douglas
Traverse
Stevens
Pope
Roberts
Big Stone
Pomme de Terre
Upper Minnesota
Chippewa
Swift
Grant
Kandiyohi
Codington
Lac Qui Parle
Chippewa
Hennepin
Deuel
Lac Qui Parle
Hawk-Yellow Medicine
McLeod
Carver
Yellow Medicine
Renville
Scott
Dakota
Lower Minnesota
Middle Minnesota
Sibley
Lincoln
Lyon
Redwood
Brookings
Le Sueur
Nicollet
Redwood
Rice
Cottonwood
Brown
Pipestone
Murray
Waseca
Steele
Watonwan
Le Sueur
Jackson
Faribault
Martin
Freeborn
Blue Earth
Emmet
Winnebago

Proposed DSS for the Minnesota River Basin

The DSS will consist of a family of models:

- Process-based hydraulic simulation models
- River and reservoir water quality models
- GIS
- Agricultural and ecological economics valuation models
- Plan formulation, alternatives analysis, and evaluation models.

Because water flow is the central process, this modeling effort will emphasize the hydrology and other material mobilization, transport, and fate processes in the MRB.

Proposed DSS for the Minnesota River Basin

The DSS will enable:

- Inventory of existing conditions,
- Forecasting of future conditions
- Simulation of alternative plans that would be ecologically sustaining and socially desired.

The DSS will address watershed, water quality, and ecosystem restoration needs at the small watershed, major watershed, tributary river, and main stem Minnesota River reach levels of spatial scale.

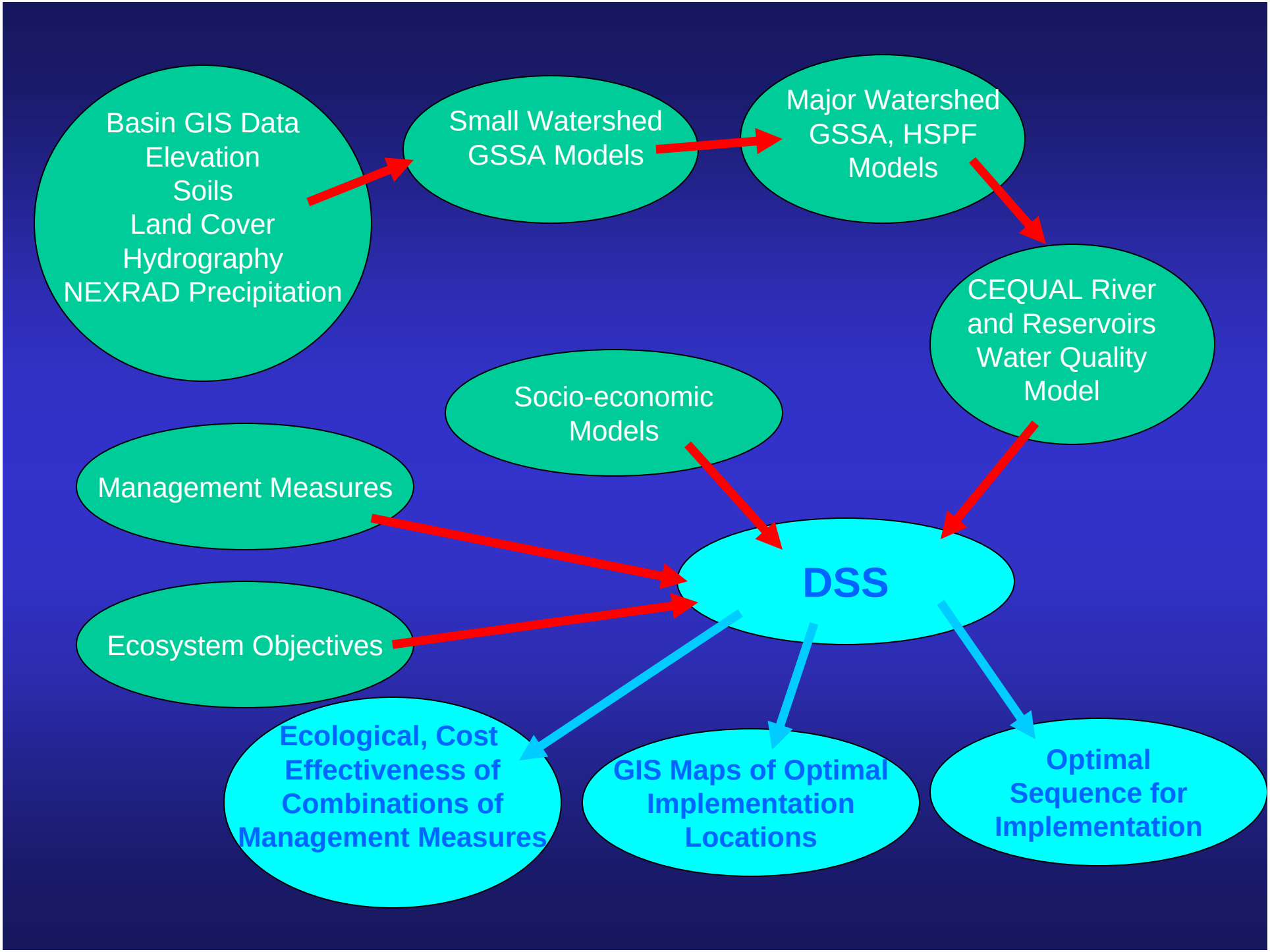
Proposed DSS for the Minnesota River Basin

The primary purpose of the DSS will be to assist in the selection, design, implementation, monitoring, and evaluation of watershed, water quality, and ecosystem management and restoration measures.

The DSS will assist decision-makers and the public in identifying optimal investments and the long-term requirements to meet planning objectives in the MRB.

Decision Support System

- Designed to meet sponsors needs
- Owned and operated by Minnesota sponsors
- Delivers results of model system simulations
- Geographically linked


Basin GIS Data
Elevation
Soils
Land Cover
Hydrography
NEXRAD Precipitation
Small Watershed
GSSA Models
Major Watershed
GSSA, HSPF
Models
CEQUAL River
and Reservoirs
Water Quality
Model
Socio-economic
Models
Management Measures
DSS
Ecosystem Objectives
Ecological, Cost
Effectiveness of
Combinations of
Management Measures
GIS Maps of Optimal
Implementation
Locations
Optimal
Sequence for
Implementation

Menu – Select Watershed Area, Scale

- **Entire Basin**
- **Major Watershed**
  - Lower Minnesota
  - LeSueur
  - Blue Earth
  - Watonwan
  - Middle Minnesota
  - Cottonwood
  - Redwood
  - Hawk-Yellow Medicine
  - Chippewa
  - LacQui Parle
  - Upper Minnesota
  - Pomme deTerre
- **Small Watershed**

  (Linked to Major Watersheds)

Menu – Select Ecosystem Objectives (one or more)

- Restore hydrologic regime
- Reduce soil erosion
- Stabilize stream channels
- Reduce sediment load to MN River
- Reduce flooding damage
- Restore native prairie
- Reduce nutrient loading to MN River
- Improve water quality conditions
- Sustainable farm economy

Menu – Select Management Measures

- **Structural BMPs** (linked to choice list)
- **Non-structural BMPs** (linked to choice list)
- **Ag drainage BMPs** (linked to choice list)
- **Hydrologic modifications** (linked to choice list)
- **Other measures** (linked to choice list)

Menu – Analyze Management Measures

- Include all
- Include single measure selected
- Include combination of measures selected

Menu – Analyze Management Action Combinations

- Identify best combination for all objectives
- Identify best for single objective selected
- Identify best for combination of objectives selected
- Spatial distribution
- Level of investment
- Best sequence for implementation

Menu – Outputs

- GIS map for management measures implementation
- Change in ecosystem services by type
- Change in economic benefits by type